is inferred to be originating from the defect states and the blue shift of the Q-band induced by the gamma irradiation.

Chapter 7 consolidates the results obtained in the thesis and puts them in the appropriate application regimes and eventually discusses the future scope of this work. Tin(II) 2,3-naphthalocyanine and vanadyl 2,3-naphthalocyanine composite thin films are found promising candidates towards applications in ultra high density storage and photoconductive devices. Also such a composite material optimization could determine optimal semiconductor energy gaps for use in one, two and three material based transparent solar cell designs. This is a current hot topic and is a campaign to increase solar energy harvesting by making transparent solar cell windows for shops and houses and eventually reduce the carbon emission by 50%.

The work presented in this thesis has either been published or in the process of publication in refereed international journals and conference proceedings.

Research Papers Published in International Journals

1. **Nisha S Panicker**, N Smijesh, Reji Philip and Menon C S, Non-linear optical properties of composite Naphthalocyanine thin films with nanocrystalline morphology, *Thin solid films* , 2011(In press).

2. **Nisha S Panicker** and Menon C S, Effects of γ-ray irradiation and thermal annealing on structural, optical and electrical properties of vacuum deposited vanadyl 2,3-naphthalocyanine thin films, *Journal of Materials Science*, **46** (2011) 4479-4486.

3. **Nisha S Panicker**, Gopinathan T G, Dhanya I and Menon C S, Optical and electrical characterization of Tin(II) 2,3-Naphthalocyanine thin films containing agglomerated spherical particles, *Physica B: Physics of Condensed Matter*, **405** (2010) 4556-4560.

4. Dhanya I, Gopinathan T G, **Nisha S Panicker** and Menon C S, Low temperature effects on electrical and optical properties of TTBNc thin films, *Journal of Non-Crystalline Solids*, **356** (2010) 160-164.

5. **Nisha S Panicker** and Menon C S, Enhanced electrical conductivity for SnNc-VONc composite thin films prepared via novel deposition techniques, *Physica status solidi - rapid research letters* (Communicated)

6. **Nisha S Panicker** and Menon C S, Molecular crystal nanoparticles of metal susbstituted naphthalocyanines, *Acta Materialia* (Communicated).

Research Papers Published in Conference / Seminar Proceedings

7. CMMP11, December 2011, Condensed matter and materials physics, *Multilayered molecular nanocrystals for solar cell devices*, Institute of Physics, Manchester, United Kingdom (Submitted)
8. ParticlesCIC-2011, April 2011, *Molecular crystal nanoparticles of metal substituted naphthalocyanines*, Nanofactory, Institute of Particle Science Engineering, University of Leeds, Leeds, United Kingdom.
9. Speed PhD-2011, January 2011, *Semiconductor organic thin films*, Paper presented at Graduate skills training and development conducted by Faculty of Engineering, University of Leeds, Leeds, United Kingdom.
10. NANOSAT-10, April 2010, "Electrical characterization of Tin(II) 2,3 Naphthalocyanine thin films containing agglomerated spherical particles" National conference on advances in Nano Science and Technology. Departments of Basic Sciences and Humanities, Amal Jyothi College of Engineering , Kanjirappally, Kottayam, India.
11. NSNST-2009, March 2009, "Effects of γ-ray irradiation on structural, optical and electrical properties of vacuum deposited vanadyl 2,3-naphthalocyanine thin films" National Seminar on Nanoscience and Technology, P.G. Department of physics, Fatima Mata National College, Kollam, Kerala.
12. NSNANO-2009, October 2009, "Electrical characterization of Tin(II) 2,3 Naphthalocyanine thin films containing agglomerated spherical particles" National Seminar on Recent Advance in Nano Science & Technology, Sree Narayana College, Kollam, Kerala .
13. Spectrum- 2007, March 2007, " Optical and Structural properties of Tin (II) 2,3 naphthalocyanine thin films", National conference on Spectroscopy, Post Graduate and Research Department of Physics, Marthoma College, Thiruvalla.
14. ORGANIC ELECTRONICS -2007, February 2007, "Electrical, Optical and Structural properties of Oligoaniline thin films" National Conference on Organic Semiconductors, Sree Narayana College, Kollam, Kerala.